

REMARKS

Claims 1-6 are pending herein. By the Office Action, the drawings and the disclosure are objected to; claims 5-6 are rejected under 35 U.S.C. §112, second paragraph; and claims 1-2 and 5-6 are rejected under 35 U.S.C. §103(a). By this Amendment, claims 1-6 are amended for clarity only and not to distinguish the art of record.

I. Formal Matters

Applicant notes that claims 3-4 are not rejected over the art of record, and therefore would appear to be allowable if the remaining objections and rejections in the Office Action are overcome.

An Information Disclosure Statement with Form PTO-1449 was filed with the application on October 22, 1997. Applicant has not yet received back from the Examiner a copy of the Form PTO-1449 initialed to acknowledge the fact that the Examiner has considered the cited information. The Examiner is requested to initial and return to the undersigned a copy of the subject Form PTO-1449. For the convenience of the Examiner, a copy of that form is attached.

II. Objection to the Drawings

The drawings are objected to under 37 C.F.R. §1.83(a) as failing to show the low friction coating on the internal surface of the bore and on the surface of the spring. Attached hereto is a Request for Approval of Drawing Corrections, which proposes to add a new Figure 4 to clearly show the low friction coatings. The specification is amended accordingly. Consideration and approval of the Request for Approval of Drawing Corrections is respectfully requested. Further, reconsideration and withdrawal of the objection is respectfully requested.

III. Objection to Disclosure

The disclosure is objected to based on a typographical error at page 2, line 13. By this Amendment, the specification is amended as suggested by the Examiner. Reconsideration and withdrawal of the objection are respectfully requested.

IV. Rejections Under 35 U.S.C. §112

A. Claims 5-6 are rejected under 35 U.S.C. §112, first paragraph, as not being described in the specification as filed. In particular, the Office Action asserts that the specification does not describe the low friction materials. Applicant respectfully traverses this rejection.

Under the law relating to 35 U.S.C. §112, the written description must communicate that which is needed to enable the skilled artisan to make and use the claimed invention. Kennecott Corp. v. Kyocera International Inc., 5 USPQ2d 1194, 1197 (Fed. Cir. 1987). An invention may be described in different ways and still be the same invention. Id. The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, rather than the presence or absence of literal support in the specification for the claim language. In re Kaslow, 217 U.S.P.Q. 1089, 1096 (Fed. Cir. 1983). The test for enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation. United States v. Teletronics, Inc., 8 USPQ2d 1217, 1223 (Fed. Cir. 1988). A patent need not teach, and preferably omits, what is well known in the art. Spectra-Physics v. Coherent, 3 USPQ2d 1737, 1743 (Fed. Cir. 1987).

Applicant respectfully submits that the specification as filed satisfies the requirements of §112, first paragraph. In particular, the specification describes at page 4, second to last paragraph, that the spring and internal surface of the bore are coated with a low friction material that is resistant to attack by sulfur and other substances in the fuel. Applicant respectfully submits that such low friction coatings are well known in the art, and therefore specific detailed description of such low friction coatings in the specification is both unnecessary and disfavored. For example, such low friction coatings are disclosed in Edwards III, such as titanium compounds.

Because the specification as originally filed sufficiently describes the low friction coatings, and because the low friction coatings are well known to one of ordinary skilled in the art, the present

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specification satisfies the requirements of 35 U.S.C. §112, first paragraph. Reconsideration and withdrawal of the rejection are respectfully requested.

B. Second Paragraph

Claims 1-6 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Applicant respectfully traverses the rejection.

The Office Action asserts that various limitations in the claims do not have strict antecedent basis. By this Amendment, the claims are amended to address this point of the rejection.

The Office Action asserts that in claim 4 there is not sufficient structure recited for the spring and duct means to provide the recited function. Applicant respectfully disagrees. In particular, as recited in claim 4 and described in the specification at, for example, page 4, third full paragraph, the function of the spring is provided by the provision of the spring within the bore, the operation of the passage of fuel through the bore, and the operation of gravity. Each of these elements is specifically recited in claim 4. Therefore, Applicant respectfully submits that claim 4 recites sufficient structure for the recited function.

Claims 5 and 6 are rejected based on the assertion that the low friction coating is relative. As described above, Applicant respectfully asserts that low friction coatings are well known to one of ordinary skilled in the art, and the use of the word "low" does not render the claim indefinite. One of ordinary skilled in the art, reading the specification and claims, would readily understand that the low friction coating is a coating applied to the respective component that lowers the coefficient of friction between the component and other components contacting the component. Because such low friction coatings are well known in the art, recitation of the low friction coating in claims 5 and 6 does not render the claims indefinite.

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For at least these reasons, claims 1-6 satisfy the requirements of 35 U.S.C. §112, second paragraph. Reconsideration and withdrawal of the rejection is respectfully requested.

V. Rejections Under 35 U.S.C. §103(a)

A. Roche in view of MVT

Claim 1 is rejected under 35 U.S.C. §103(a) over Roche in view of Maria-Vittorio-Torrisi ("MVT"). The Office Action asserts that Roche discloses a fuel injector for an engine afterburner substantially as claimed, except for the limitation of a means for cleaning the inside surface of a duct. The Office Action then asserts that MVT teaches using a piston to clean the internal surface of a nozzle. Applicant respectfully traverses this rejection.

Applicant respectfully submits that the claimed invention would not have been obvious over a combination of Roche and MVT at least because the references, either alone or in combination, do not teach or suggest the claimed invention. In particular, the references do not teach or suggest a gas turbine engine afterburner igniter, as claimed.

First, Roche is directed to a component of a turbine engine afterburner that is completely distinct from the turbine engine afterburner igniter of the claimed invention. In particular, with respect to Figure 1 of the present specification, the claimed invention is directed to an afterburner igniter, identified in Figure 1 as item 17. In contrast, Roche is directed to a fuel injector for an afterburner, such as identified in Figure 1 as fuel injector 18. See, for example, Roche at Figure 1 and the Abstract. Nowhere does Roche teach or suggest that the disclosed fuel injector is in any way applicable to an afterburner igniter, as presently claimed.

As such, Roche pertains to non-analogous art and, thus, there would have been no motivation to combine Roche with MVT. Prior art references must be "within the field of the inventor's endeavor ... [or] reasonably pertinent to the particular problem with which the inventor was involved." Union Carbide Corp. v. American Can Co., 724 F.2d 1567, 1572, 220 USPQ 584, 588 (Fed. Cir. 1984).

Roche discloses a fuel injector for an afterburner, not an afterburner igniter as claimed. As is well known in the art, the purposes of these components, and their operating environments, are different, and one is not readily applicable to the other. The artisan would not readily recognize these components as being interchangeable with each other. Thus, Roche is not within the same field of endeavor as the present invention.

Neither is Roche reasonably pertinent to the particular problem with which Applicant is involved. As described in the specification, at pages 1-2, a major problem with the use of hotshot ignition systems in gas turbine afterburners is that carbon debris left by burnt or boiling fuel in the injector rapidly builds up. It is believed that the cause of the carbon debris build up in the injector is due to the large temperature gradient that exists between the combustion chamber itself, which may be of the order of 1300°C, and the space between the combustion chamber outer casing and the wall of the combustion chamber, which may be of the order of 130°C. Roche does not appear to teach or suggest that this temperature gradient problem, and resultant carbon debris build up in the injector, is applicable to the fuel injector of Roche. Thus, whereas the claimed invention is directed to solving the problem of carbon debris build up in the afterburner igniter by using a moveable resilient means to abrade part of an internal surface of a bore of the afterburner igniter, Roche is directed to cooling the fuel tube of a fuel injector. Accordingly, Roche is non-analogous art improperly cited against the present claims.

Even if Roche is properly citable against the present claims, Roche fails to teach or suggest all of the limitations of the present claims. In particular, Roche does not teach or suggest a moveable resilient means provided within a fuel duct such that during operation the moveable resilient means moves relative to the fuel duct due to passage of fuel within the fuel duct so as to abrade at least some of an internal surface of a bore of the duct. To overcome this deficiency, the Office Action cites MVT. However, a combination of the two references is improper, and any resultant combination would not result in the claimed invention.

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In the present case, Roche specifically teaches the use of a cooling device to cool the fuel injector. The purpose of the cooling device is to prevent coking of the fuel injectors. See, for example, Roche at column 1, lines 24-30. Because Roche focuses on this coking, and solves the problem by using a cooling device to prevent formation of coke in the first instance, it would have been non-obvious, and contrary to the specific teachings of Roche, to remove the cooling device and insert a plunger arrangement such as disclosed in MVT. Therefore, one of ordinary skill in the art would not have been motivated to utilize the plunger arrangement of MVT in the fuel injector of Roche. Accordingly, one of ordinary skill in the art would not have been motivated to modify the teachings of Roche with the teachings of MVT and arrive at the present invention.

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Still further, one of ordinary skill in the art would not have combined the teachings of Roche and MVT, because there is no demonstrated expectation that such a combination would work. In particular, as well known to one of ordinary skilled in the art, it is important that the fuel passageway in the afterburner igniter remains substantially unrestricted so that a consistent fuel pressure is maintained. A consistent fuel pressure is important to controlling the direction and shape of the resultant jet of fuel produced by the jet engine and afterburner. According to the claimed invention, the moveable resilient means such as a spring does not affect a large cross-section of the bore, and therefore forms a negligible restriction to fuel flow through the bore. In contrast, MVT discloses a complex arrangement of a piston head, a helical rib, and a returning force member that would be readily recognized by one of ordinary skilled in the art to be inappropriate in an afterburner igniter. In particular, the structure disclosed in MVT is cyclical, and would introduce fluctuations in fuel fluid pressure. This would result in a consequent lack of control of direction and shape of the resultant jet of fuel.

Nowhere does either Roche or MVT teach or suggest how the practical deficiencies of the apparatus of MVT could be addressed in the context of an afterburner igniter. Accordingly, one of ordinary skilled in the art would not have looked to the plunger device of MVT, and incorporate it into a fuel injector of Roche.

For at least these reasons, claim 1 would not have been obvious for one of ordinary skilled in the art over Roche in view of MVT. Reconsideration and withdrawal of the rejection is respectfully requested.

B. Roche, MVT and Edwards

Claim 6 is rejected under 35 U.S.C. §103(a) over Roche in view of MVT and Edwards '822 ("Edwards"). Applicant respectfully traverses this rejection.

Edwards is cited for its asserted disclosure of a low friction coating of titanium carbide, titanium nitride or titanium boride on the surfaces of fuel nozzles in fuel lines to prevent the disposition of carbon or coke on the surfaces. However, regardless of this disclosure of Edwards, Edwards fails to overcome

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the deficiencies of Roche and MVT, described in detail above. In particular, nowhere does Edwards teach or suggest a gas turbine engine afterburner igniter according to the claimed invention, which includes a moveable resilient means provided in a fuel duct such that during operation the moveable resilient means moves relevant to the fuel duct due to passage of fuel within the fuel duct so as to abrade at least some of an internal surface of a bore of the duct.

For at least these reasons, claim 6 would not have been obvious to one of ordinary skill in the art over a combination of Roche, MVT and Edwards. Reconsideration and withdrawal of the rejection are respectfully requested.

C. Roche in view of Barnes

Claims 1-2 are rejected under 35 U.S.C. §103(a) over Roche in view of Barnes. The Office Action asserts that Roche substantially teaches the claimed invention, except for the inclusion of a moveable resilient means in the duct. However, the Office Action asserts that Barnes teaches using a spring in a spray nozzle to remove deposits in the nozzle, and that it would have been obvious to incorporate such a spring into the fuel injector of Roche. Applicant respectfully traverses this rejection.

As described above, Roche would not have rendered obvious the claimed invention. In particular, Roche is directed to a different component of a jet engine than the claimed invention, and does not teach or suggest applicability of the disclosed fuel injector to an afterburner igniter, as claimed. Furthermore, the problem addressed by Roche, namely prevention of coking of the fuel injector, and the solution of providing a cooling device, are entirely different from the problem and solution of the claimed invention. Nowhere does Roche teach or suggest modifying the disclosed fuel injector to include a device, such as a spring, of Barnes.

Furthermore, Applicant respectfully submits that a combination of Barnes and Roche is improper, for the same reasons as described above with respect to Roche and MVT. In particular, like the plunger device of MVT, the references do not teach or suggest, and in fact teach away from, modifying the fuel injector of Roche to include the spring of Barnes.

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Nowhere do the references teach or suggest that the respective teachings could or should be combined, or that the resultant combination would have any expectation of success. In Barnes, a spring 9 is disposed within an annulus 5 to form a helical duct through which all fluid passes. The helical duct can be deformed by manual operation of either a spindle 1 or a barrel 4, the deformation crushing sediment lying within the duct. See, for example, Barnes at Figure 2. Nowhere does Barnes teach or suggest abrading a surface of the bore, or provision for automatic operation of the abrasion mechanism.

Accordingly, the claimed invention would not have been obvious to one of ordinary skill in the art over a combination of Roche and Barnes. Reconsideration and withdrawal of the rejection are respectfully solicited.

D. Roche, Barnes and Edwards

Claims 5-6 are rejected under 35 U.S.C. §103(a) over Roche in view of Barnes and Edwards '822 ("Edwards"). Applicant respectfully traverses this rejection.

Edwards is cited for its asserted disclosure of a low friction coating of titanium carbide, titanium nitride or titanium boride on the surfaces of fuel nozzles in fuel lines to prevent the deposition of carbon or coke on the surfaces. However, regardless of this disclosure of Edwards, Edwards fails to overcome the deficiencies of Roche and Barnes, described in detail above. In particular, nowhere does Edwards teach or suggest a gas turbine engine afterburner igniter according to the claimed invention, which includes a moveable resilient means provided in a fuel duct such that during operation the moveable resilient means moves relevant to the fuel duct due to passage of fuel within the fuel duct so as to abrade at least some of an internal surface of a bore of the duct.

For at least these reasons, claims 5-6 would not have been obvious to one of ordinary skill in the art over a combination of Roche, Barnes and Edwards. Reconsideration and withdrawal of the rejection are respectfully requested.

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VI. Status of Secrecy Order

At paragraph 15 of the Office Action, the Examiner points out that the present application contains security classification markings, but apparently asserts that the markings are objectionable and improper because the present application is not under a secrecy order. The Office Action thus requires that the security classification markings be removed, or that necessary steps be taken to have a secrecy order imposed.

Applicant does not understand the basis of the objection in paragraph 15. In particular, Applicant respectfully submits that the present application is in fact under a secrecy order. For clarification, Applicant attaches hereto a copy a communication issued by the Patent Office on May 6, 1999, indicating that the present application is under a secrecy order, and that renewals of the secrecy order are automatic until rescinded. Accordingly, Applicant respectfully submits that the present application is under a secrecy order, and requests that the application be treated accordingly.

VII. Conclusion

In view of the foregoing amendments and remarks, Applicant respectfully submits that the application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

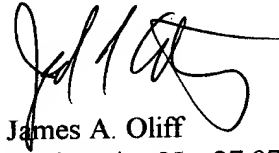
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Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

Respectfully submitted,



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Attachments:

Form PTO-1449
May 6, 1999 Patent Office Communication

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